



September 30, 2022

The Honorable Chair and Members
of the Hawai'i Public Utilities Commission
Kekuanao'a Building, 1st Floor
465 South King Street
Honolulu, Hawai'i 96813

Dear Commissioners:

Subject: Docket No. 2019-0323
Instituting a Proceeding to Investigate Distributed Energy Resource Policies
Hawaiian Electric's Functional Integration Plan

Pursuant to Decision and Order No. 38429 ("D&O 38429") issued on June 17, 2022 in Docket No. 2018-0088 (Performance-Based Regulation Proceeding),¹ Hawaiian Electric² respectfully submits its Functional Integration Plan ("FIP") for Distributed Energy Resources ("DER"). The purpose of the FIP is to increase transparency into Hawaiian Electric's plans and progress for utilizing cost-effective grid services from DERs and ensure that the necessary functionalities and requisite technologies are in place to do so. Hawaiian Electric appreciates the opportunity to submit its FIP and looks forward to the Commission's direction on this matter.

Sincerely,

/s/ Yoh Kawanami

Yoh Kawanami
Director
Customer Energy Resources Operations

Enclosures

¹ D&O 38429 instructs Hawaiian Electric to submit a FIP for DERs in the subject proceeding, no later than October 1, 2022.

² Hawaiian Electric Company, Inc., Hawai'i Electric Light Company, Inc., and Maui Electric Company, Limited (collectively referred to herein as "Hawaiian Electric" or the "Company") are each doing business as "Hawaiian Electric" and have jointly registered "Hawaiian Electric" as a trade name with the State of Hawaii Department of Commerce and Consumer Affairs, as evidenced by Certificate of Registration No. 4235929, dated December 20, 2019.

HAWAIIAN ELECTRIC COMPANY, INC.
MAUI ELECTRIC COMPANY, LIMITED
HAWAI'I ELECTRIC LIGHT COMPANY, INC.

FUNCTIONAL INTEGRATION PLAN

September 30, 2022

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I. Introduction

Hawaiian Electric¹ presents this Functional Integration Plan (“FIP”) that develops a pathway for the Company to dispatch and utilize Distributed Energy Resources (“DER”) for grid services. The Company has relied on a nationally accepted standard of OpenADR 2.0b as its communication protocol and will continue to do so for many of the customer-sited resources integrated into the Company’s grids. However, with the growing deployment of battery storage, a new protocol IEEE2030.5 is emerging as an additional communication protocol that is critical to the integration of battery storage systems and other DER into the Company’s Distributed Energy Resources Management System (“DERMS”).

While the IEEE2030.5 protocol has been around for many years, it is still in pilot stages of deployment in many jurisdictions, including California where a certification process for this protocol has been fully implemented. Importantly, the Company’s proposed Bring Your Own Device (“BYOD”) Program, which is scheduled to go-live in July 2023, will be one of the first non-pilot full-scale programs focused on residential sector to implement dispatchable grid services via IEEE2030.5. Thus, Hawai’i is again at the forefront of innovation when it comes to the integration and growth of DER as a provider of grid services.

In Order No. 37066, issued on April 9, 2020, the Commission directed that the DER Program Track will establish long-term DER Programs that transition customers from the various interim DER tariffs currently in place, and that properly compensate customers for both energy exports and grid services. The Company agrees and supports this directive to simplify customer options with a basic offering of the Smart DER Tariff with export and non-export options. Moreover, this FIP focuses on the infrastructure development for three levels of the advanced BYOD Program. It is important to note that this FIP is at a high-level and subject to change given that the specific requirements for the new long-term DER Programs are pending review and approval by the Commission.

For these reasons, this FIP will necessarily be revised and updated as the Company continues to innovate and learn, and is informed by future programmatic developments and requirements. The Company is committed to continuing to collaborate with the solar industry and the Consumer Advocate (“Parties”) in future iterations of this FIP.

The Company appreciates the opportunity to provide this FIP to help the Commission and the Parties understand the Company’s current, high-level pathway for integrating dispatchable DERs that provide grid services. The Company has attached Appendices A and B that provide a detailed schedule, requirements, tasks, deliverables, and assumptions. As shown in Appendices A and B, this integration work is substantial and complex, and much of it needs to be done sequentially. As explained in Hawaiian Electric’s DER Program Transition Plan, filed June 30, 2022, to avoid customer and market confusion and ensure a smooth and successful launch of the new DER programs, the Company requests a logical sequencing of rulings, i.e., ruling on Advanced Rate Design (“ARD”) proposals then a ruling on the Program Track proposals, and as much time as possible to then implement this FIP. The Company is

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fully committed to further expansion of DERs to customers, and strives for success in providing this next evolution of long-term DER offerings to customers that will advance Hawai'i's progress towards its renewable goals.

II. Background

On June 16, 2022, the Commission issued Decision and Order No. 34829 in Docket No. 2018-0088 ("D&O 34829"), ordering the Company to develop a FIP for DER that presents the Company's plans and progress for utilizing cost-effective grid services from DERs.

Pursuant to D&O 34829, the FIP must include steps, timelines, milestones, and projected investments/budgets necessary to achieve the key functionalities and technologies necessary for Bring Your Own Device ("BYOD") and Grid Services Purchase Agreement ("GSPA") program resource utilization.² Furthermore, the Commission directed that, at a minimum, the Company address the following requirements:

- Remote DER dispatch capabilities;
- Energy management system integration and automatic dispatch;
- Communication technologies (Wifi, cellular, network, etc.);
- Specific advanced inverter functionalities and logistics of deploying/implementing such functionality;
- Billing and crediting systems, including direct retail crediting for exports during grid event windows;
- Cybersecurity requirements;
- Integrated measurement/visibility of dynamic system operations and performance verification; and
- Updates to system operations and dispatch manuals and consideration of including environmental impacts in resource dispatch.³

In addition, the Commission ordered the Company to make written commitments in the FIP regarding transparency and information sharing, and provide an Evaluation, Measurement, and Verification ("EM&V") plan for all DER and Demand Response ("DR") Programs.⁴

III. Scope

This FIP is focused on current customer-sited grid service programs and future programs that are planned to go-live within the next twelve months. The activities described in this FIP apply to all islands/service territories and will be implemented at the same time.

The FIP is currently a living planning document that will continue to be updated as the Company learns more through the progression of each of the three main stages of integrating cost-effective grid services from DERs: planning, implementation, and operation. As the FIP requires a status update of what was

² See D&O 34829 at 62.

³ *Id.* at 62-63.

⁴ See *id.* at 63-64.

completed, what's to come, and then migrating over to the reporting of the results, the Company proposes to include the FIP as an appendix to existing reports that the Company files. Thus, the FIP will be updated twice a year and filed in March and November in Docket No. 2007-0341 (see Section VIII-Communication Plan). The Company plans to continue to update the FIP for one year after BYOD is fully implemented.

Specifically, for this FIP, the Company will describe the activities related to Grid Services Purchase Agreement ("GSPA") integration with aggregators, battery bonus, and the BYOD program (three levels) proposed by the Company in the DER proceeding that are currently under review by the Commission. The Company has experience in integrating aggregators from previously approved GSPAs and will apply that experience and lessons learned to integrate the new GSPA awaiting Commission decision in Docket No. 2022-0041 (GSPA for O'ahu with Swell Energy). In regard to the BYOD program and its three options, without an Order from the Commission specifying program requirements, the Company is basing this FIP on many assumptions for the programs' requirements and schedule such as the Company is assuming an Order will be issued in October 2022 such that necessary requirements could commence in November 2022.

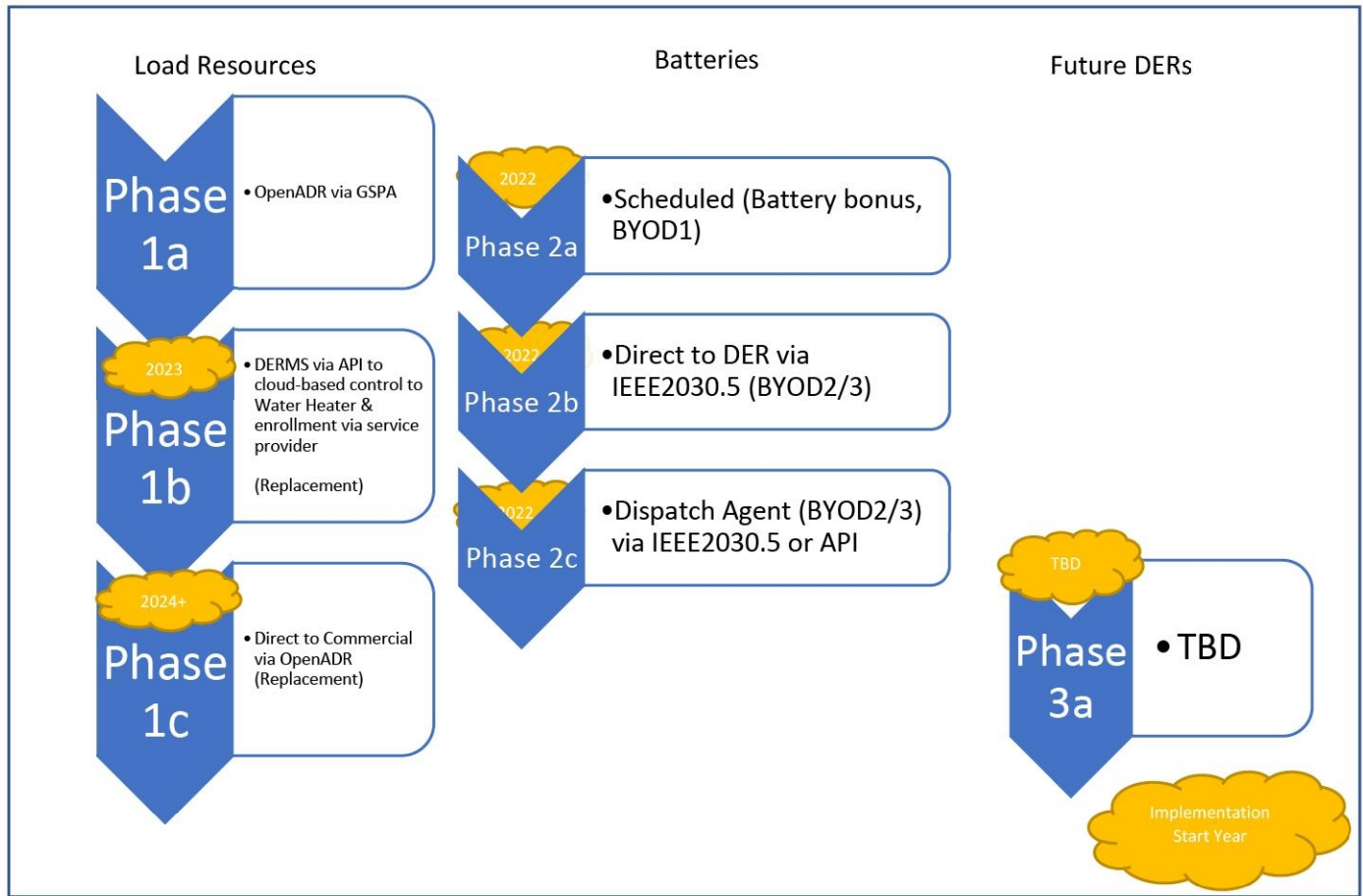
The first FIP update will be filed in November 2022 with the latest information available relating to the DER initiatives, such as Advanced Rate Design ("ARD"), Smart DER Tariff, and Guidance for the Transition of DER Programs ("GTP"). There are clear ties and interdependencies between BYOD development and all of these initiatives. The implementation of most of these initiatives must be done serially through prioritization and optimizing resources. This FIP will present the Company's current pathway and associated risks for implementation of the BYOD program in July 2023. Future updates will include functionality upgrade requirements for new programs and existing programs, such as the legacy DR program that is undergoing a replacement of technology that is over a decade old.

Phased Implementation

In order to offer cost-effective grid services, the Company is focused on basing grid service program and technical requirements on internationally accepted industry standards. Nearly a decade ago, the Company committed to utilizing the OpenADR communication protocol to manage customer-sited load resources. This protocol, which is currently OpenADR 2.0b, continues to be a valid protocol for such resources, and therefore the Company will still use OpenADR as a primary communication protocol when it becomes time to replace older communication technology (i.e. legacy DR programs) in certain segments of DERs. All of the Company's current grid services programs, including aggregator integrated grid services, use OpenADR2.0b.

Recently emerging DER such as battery storage did not adopt OpenADR 2.0b. Instead, based on industry and stakeholder feedback, the IEEE2030.5 communication protocol was selected to control batteries. Table I below depicts at a high level the Company's options of DER resources broken down into phases and how OpenADR and IEEE 2030.5 communication protocols are applied in this FIP development.

Table I - Options of DER Resources



Phase 1, which is already implemented, is the OpenADR pathway. In Phase 1a, OpenADR enables system level dispatch to GSPA resources. Currently, the Company’s Residential Direct Load Control (“RDLC”) Program manages approximately 30,000 water heaters that utilize a paging network and a proprietary connection for one-way communication to the direct load control boxes in the water heaters. The Company plans to replace this technology in Phase 1b by utilizing an Application Programming Interface (“API”)⁵ to interface with the cloud-based system for the water heater controllers. The vendor will operate under a contract requiring it to, among other requirements, monitor communications to the water heaters, provide remote (over the air) updates, and deliver relevant status and telemetry data to the DERMS. In Phase 1c, the Company will rely on OpenADR Virtual End Nodes (“VENs”) to replace existing direct load control devices, which will provide telemetry and other data monitoring capabilities to participants and the Company.

Phase 2 is the development of the IEEE2030.5 infrastructure into the Company’s functionality capabilities. Hawaiian Electric and its DERMS provider will work with a IEEE2030.5 platform provider to

⁵ An API is non-standard code and requires specialized testing and often modification for each update of the base application (i.e. DERMS). As such, it can often be expensive and time consuming to maintain. The Company only considered API as an option for the RDLC water heater replacement because the program has so many participants, and therefore, the impact of the replacement will be relatively large.

accomplish this development. Based on the Company's proposal for BYOD Level 1, it is assuming that BYOD Level 1 is going to be very similar to the Battery Bonus program. As such, the infrastructure for accepting BYOD Level 1 resources is predominantly already in place and in-progress. The Company is continuing to refine its infrastructure and processes for the Battery Bonus program, such as issuing year-end checks, applying penalties, and adding a termination process. All of these in-progress activities should be transferable to the implementation of BYOD Level 1.

For BYOD Levels 2 and 3, where the resources need to be dispatchable, the DER parties have described two different pathways of connecting to DER via IEEE2030.5, where one is a direct connection and the other is through a dispatch agent.

The role of a dispatch agent is expected to be similar to the Company's aggregator model. However, a dispatch agent may not go through a procurement process and may have a different contracting mechanism from the aggregator model. The Company and the Parties are still in discussions on clearly defining the roles and responsibilities of the dispatch agent. While these two pathways (direct connection and dispatch agent) are described as two different phases, the Company proposes in this FIP that the development for both will be done simultaneously and will start the implementation work this year. If the dispatch agent is able to commit to a large amount of kW delivery (minimum amount to be determined), an API approach may be considered in lieu of IEEE 2030.5.

It is the Company's understanding that the electric vehicle industry is also accepting IEEE2030.5 as its communication protocol standard. Therefore, as more electric vehicles become available, the Company's Phase 3 would be focused on implementing a solution for electric vehicle participation in the BYOD Program. The Company expect non-battery solutions to participate in the BYOD Program through the OpenADR 2.0b protocol.

A. Requirements

High-level requirements for each program are listed in Table II-1. The deliverables, tasks, and related assumptions for each requirement are described in Appendix B. Both Appendix A and B show the status for each requirement, which will be updated in future FIP filings.

Table III-1: Status of Requirements

Requirement Number	High-Level Requirement	GSPA	BYOD1	BYOD2	BYOD3
1	Remote DER Dispatch Capabilities	A	NR	FIP	FIP
2	Customer Enrollment	Yes	Yes	FIP	FIP
3	Customer Device Installation	A	3 rd	3 rd	3 rd
4	Communication Technologies	NR	NR	FIP	FIP
5	Advanced Inverter Functionalities	NR	NR	FIP	FIP
6	Cybersecurity	Yes	NR	FIP	FIP
7	System Operations and Dispatch Manuals	Yes	NR	FIP	FIP
8	EMS Integration	NR	NR	NR	NR
9	Billing and Crediting Systems	Yes	FIP	FIP	FIP
10	Customer Recruitment	A	3 rd	3 rd	3 rd
11	EM&V	Yes	FIP	FIP	FIP

Key

- a. A-Aggregator
- b. 3rd - 3rd Party Contractor
- c. NR-not required
- d. Yes- implemented now
- e. FIP - Will implement as part of FIP

All identified requirements (Requirements #1 – 11 in the table above) are interdependent of each other for the successful implementation of the BYOD Program. However, certain requirements have a stronger dependency than others. For example, upon Commission approval of the BYOD Program, certain requirements may have to be updated and will become interdependent of each other. Requirements #1, 3, and 4 are interdependent and will need to align upon Commission order. Furthermore, while EMS integration (#8) is not currently required for the BYOD Program, it is interdependent with updating the System Operations and Dispatch Manuals (#7).

As described above, the Company sees linkages to other proposed deliverables in the DER Proceeding, such as ARD, Smart DER Tariff, and GTP, which could impact the timing of the deployment of the BYOD Program. The Company recommended that the Smart DER Tariff be implemented after the Company completes an updated Grid Needs Assessment, which then allows the Company to complete a revised calculation of export compensation rates.⁶ This proposal allows a longer runway to launch the new DER Programs that will avoid higher costs associated with the Company providing LTE cellular meters to new DER customers in advance of full deployment of advanced meters. As such, the Company sees interdependency between BYOD's overall success and cost-effectiveness with the progress of advanced meter deployment.

B. GSPA Implementation

The Company has executed three GSPAs with two aggregators. Both aggregators have been successfully integrated into the Company's DERMS. The integration process is specified in each of the GSPA contracts under the Data, Integration, and Testing Requirements Exhibit. The GSPA integration process starts with identifying and documenting the specific activities required for integrating both participation and command and control functions, i.e., the Test Plan. The Test Plan is agreed upon by the Company and the aggregator. Typically, the integration process takes a minimum of 90 days. The Company's requirements for data exchange and control functions have been documented in the Aggregator Handbook.⁷

The Aggregator Handbook defines command and control, telemetry, forecasting, reporting and enrollment transactions required to be performed by the aggregators and the necessary data and formatting rules that must be followed to perform the transactions. The integration process first requires establishing secure communications for enrollment transactions and telemetry and control

⁶ See Hawaiian Electric's Proposal on the Remaining Issues Identified in Decision and Order No. 38196, at 2, filed in Docket No. 2019-0323 on April 19, 2022.

⁷ [Hawaiian Electric Companies' Aggregator Handbook](https://www.hawaiianelectric.com/products-and-services/customer-incentive-programs/installer-information): <https://www.hawaiianelectric.com/products-and-services/customer-incentive-programs/installer-information>

data. Once communications have been established, approximately 30 tests primarily focused on enrollment, must be successfully executed to complete integration.

The command and control, and telemetry components of the aggregator's system must be OpenADR certified by the OpenADR Alliance. OpenADR certification ensures a certain base functionality and security but does not guarantee interoperability with the Company's DERMS. The Aggregator Handbook specifies a series of tests to ensure interoperability between the aggregator's system and the Company's DERMS. For example, the Company found that an OpenADR VEN manufacturer was OpenADR certified, but experienced an interoperability issue where specific data intervals used in telemetry did not meet the requirements of the program, which required the manufacturer to perform firmware upgrades to achieve the necessary functionality.

Enrollment transactions include start, end, and updates to enrollment characteristics, such as enabled capability updates. These transactions are relatively complex components of the integration process; multiple iterations and data sets are required to complete the test suite. Furthermore, tests are scenario driven and build upon each other, with each test successively more complex, and as a result must be executed serially.

Once the aggregator is integrated, the System Integration Date is established, Contract Year 1 begins and the aggregator starts delivering grid services. As long as the aggregator is using the same technology, the second integration time is expected to be shorter as the interoperability between the aggregator and DERMS has already completed the necessary testing.

C. BYOD Implementation

As set forth above, the Commission specified items that at a minimum should be included in the FIP that are necessary for BYOD and GSPA programming and implementation. The Company reviewed the Commission's items and expanded the list to include program implementation components that the Company has learned based on its experience that would also need to be addressed for a successful BYOD functional implementation. The Company's additions are denoted in the sections that follow as "Added by Company." Below is a general description of each item. Appendix A presents the current schedule and Appendix B presents details on tasks, deliverables, and assumptions.

i. Remote DER Dispatch Capabilities

As more renewable generation is added to the electric grid, the ability to dispatch DER will play an increasingly important role for system reliability. Aggregators (via GSPA) that rely on DER to provide contracted grid services are required to have remote DER dispatch capabilities. However, the contracted aggregators may use their discretion to provide the capacity awarded for a particular grid service using whichever means is appropriate.

Remote DER dispatch capabilities are required for BYOD programming (currently assumed for BYOD Levels 2 and 3) and implementation. The Company will prepare a path for both direct communication and communication through a dispatch agent to increase the remote DER dispatch capabilities for BYOD resources. A key step to build these capabilities is the implementation of IEEE 2030.5 functionality into the software platform that is integrated into the Company's DERMS. The Company has contracted with the software vendor and will be focused on bringing the platform online this year to prepare for the testing for both direct communications as well as through a dispatch agent.

ii. Customer Enrollment (Added by Company)

Customers enrolling in BYOD, battery bonus, and GSPA programs with inverter-based resources will be required to submit amendments using the Customer Interconnection Tool (“CIT”) to seek approval for the change in size and/or operational characteristics of a DER system that may have impacts to the grid.

Customers with inverter-based resources, as well as those with legacy demand response resources, will also be required to enroll in the Company’s DERMS. Enrollment in the DERMS is required for DER controllability, as well as interfacing with the Company’s billing and crediting systems. The current enrollment process for Battery Bonus customers utilizes CIT to trigger enrollment file uploading to the DERMS. Aggregators post an enrollment file via an SFTP site that the Company downloads and uploads into the DERMS system to enroll the customers. BYOD customers are expected to enroll using similar methods, whether they participate via direct communication or through a dispatch agent.

The CIT vendor has notified the Company recently regarding its platform upgrade which would increase customer experience and also give more flexibility to perform its own configuration changes. The Company is currently assessing the timing of when the upgrade should take place knowing that the other CIT initiatives, such as Smart DER Tariff and BYOD, needs to be ready for execution. The Company is leaning towards moving forward with this platform upgrade first, as it may provide a better customer experience by avoiding the usage of a different graphical user interface during their application process. A status update will be provided in the November filing regarding this matter.

iii. Customer Device Installation (Added by Company)

As explained above, there are two current options for a customer to participate in the BYOD Program⁸:

- Option 1 is a customer that purchases an inverter gateway or uses one already installed in the inverter, if available, and enrolls that device into the BYOD Program through a direct connection to the DERMS.
- Option 2 is with a dispatch agent where the inverter would communicate using a standardized (preferably IEEE2030.5) or proprietary protocol to a third-party cloud service, and the cloud service would communicate to DERMS via the IEEE 2030.5 communication protocol. The Company recommends using customers’ Wi-Fi/ethernet as an initial path to cloud connection. See “Communication Technologies” in the next section for further details.

Customers participating in GSPA programs will continue to rely on the established aggregator model. Aggregators are required to enroll and maintain customers in order to provide the contracted capability under the GSPAs.

iv. Communication Technologies

The Company is assuming that the dispatch agents, as the primary interface to the DERMS to dispatch DERs, are responsible for identifying and ensuring telecommunications to the DERs for their contracted or committed capacity. Any DER participating directly in the programs requiring telecommunications without a dispatch agent are required to maintain reliable Wide Area Network (“WAN”) connectivity to the Company’s DERMS, including home internet. As the BYOD Program matures, and pending the EM&V result of connectivity, the Company will consider whether an update to the communication

⁸ As described earlier, while other resources will be targeted in a later Phase, Phase 2 will focus on customer-sited batteries charged by solar as a key resource for BYOD participation.

technologies is required. The Company may look into public or private cellular as a means to increase connectivity rate of participating devices.

Program maintenance encompasses continued customer recruitment to replace participants lost to normal attrition, event operation or operational readiness, and performance improvement or maintenance.⁹ Program maintenance activities continue to occur during all phases of the program lifecycle, including during the participant acquisition phase of the program (if an explicit enrollment period is specified). The tasks to maintain a program include, but are not limited to, the following:

- Monitoring end-use connectivity and performing necessary remediation;
- Managing participant move ins and move outs;
- Monitoring participant performance and performing necessary remediation;
- Recruiting replacement participants; and
- Settlement or participant incentive payments.

For purposes of BYOD implementation, maintenance will focus on maintaining end-use connectivity and performance, and the actions and contract obligations necessary to ensure optimal performance of the end use. For Option 1, under “Customer Device Installation” discussed above, the Company may select a third-party entity to perform this maintenance; for Option 2, the dispatch agent is expected to perform the maintenance. The Company will continue to pursue these options while a Commission Order on the BYOD program requirements is pending. A reassessment of the requirements may be required after an Order is issued.

v. Advanced Inverter Functionalities

Inverter devices intended to participate in any of the programs requiring telecommunications are expected to meet the functionality specified in Rule 14H at the time of program launch. Legacy devices not certified to the current requirements in Rule 14H may still be able to participate in the telecommunication programs, provided the program allows for it and the legacy devices connect through a gateway compatible with the California Common Smart Inverter Profile (“CSIP”) IEEE 2030.5 architecture.

All resources participating under BYOD Program Levels 2 and 3 are required to be certified to CSIP, as well as listed on Hawaiian Electric’s Qualified Equipment List in compliance with the Rule 14H requirements mentioned above. The combination of these two certification sources ensures the highest standardized level of interoperability for participation in the program.

For the dispatch agent option, the Company will require the dispatch agent to be certified as an aggregator under the CSIP certification. The dispatch agents, as the primary interface to the DERMS to dispatch DERs, are responsible for identifying and ensuring any advanced inverter functionalities and the logistics of deploying/implementing such functionalities in order to meet contracted or committed capacity.

⁹ Performance improvement and maintenance in this instance refers to individual participant performance (not to be confused with EM&V for the entire program), such as ensuring resources are connected and available to receive controls or are performing as initially specified.

The FIP is built on the assumption that all Parties including the Commission agree that the CSIP is a sound and reasonable certification framework to utilize as opposed to the Company building a brand-new self-certification framework. The Company and Parties are continuing discussions on whether a dispatch agent also needs to be CSIP certified. The Company's position is that, if there is a software platform that is being introduced between the Company's DERMS and the customer-sited device, then the dispatch agent needs to be listed under the CSIP aggregator list. However, if the role of the dispatch agent is to connect the customer-sited resource directly to the Company's DERMS, then CSIP certification may not be required as long as the customer-sited resource is CSIP certified.

vi. Cybersecurity

The Company recognizes the need to develop and maintain cybersecurity requirements for DER as the number of these systems and devices continue to increase and the programs offered by the Company evolve.

The Company prefers to use an approved national standard for developing DER cybersecurity requirements. Based on internal reviews and recommendations from industry experts, the Company will use the finalized Institute of Electrical and Electronics Engineer 1547.3 Guide for Cybersecurity of Distributed Energy Resources Interconnected with Electric Power Systems ("IEEE 1547.3") as its basis for developing DER cybersecurity requirements. Currently, IEEE 1547.3 is in draft form, and the Company is monitoring the status of the proposed standards. Once the standards are finalized, the Company will document its IEEE 1547.3-based DER cybersecurity requirements.

In the interim, the Company will continue to utilize the National Institute of Standards and Technology (NIST) cybersecurity program to review and assess the risk and security controls associated with DER systems. This program is based on the NIST Cybersecurity Framework and includes security controls from NIST Special Publication 800-53.

vii. System Operations and Dispatch Manuals

The new BYOD Program will be available to system operators to dispatch based on their operational constraints. The Company will update the training and procedures for system operators to reflect this new program.

viii. Energy Management System (EMS) Integration

The Company's Energy Management System used by Hawaiian Electric's System Operations to balance power and energy across the grid will not require integration based on the assumed and planned operational and technical characteristics of DER under the BYOD Program Levels and GSPA contracts.¹⁰ System operators are intending to use the DERMS platform they are currently familiar with as the primary method for dispatching DERs as needed based on the design of the programs and contracts.

¹⁰ See Hawaiian Electric's Responses to Information Requests filed in Docket 2018-0088, on March 4, 2022, CA/HECO-IR-13: "The highest level of integration, such as into Automatic Generation Control, would only be required for resources that are providing economic dispatch capabilities and/or supplemental frequency control. Such resources would need to be fully dispatchable on a continuous basis over a reasonable period of time (minimum one hour as an example) on a four second control cycle with accurate immediate response within seconds to 0.1 MW accuracy."

ix. Billing and Crediting Systems

As mentioned in the Customer Enrollment section, the DERMS has an interface to the Company's SAP billing and crediting system. The SAP system will be required to correctly associate any credits and debits from the programs to the payee and payor, respectively. Any new programs, such as BYOD, Battery Bonus, and GSPA, require substantial SAP configuration and testing prior to launching the new program. Identifying final program requirements impacting the SAP configuration is critical to ensuring a smooth program launch.

The Company plans to apply its lessons learned and existing incentive structure that have been built for the GSPAs and Battery Bonus Program. The Company is continuing to update the SAP function for Battery Bonus to prepare for the end of the year reconciliation. These activities will provide direct benefits to the implementation of the BYOD Program. However, this FIP does not currently include the calculation of the export credit using advanced meter information as this feature was not proposed for the Company's BYOD Program.

x. Customer Recruitment (Added by Company)

Customer recruitment will vary depending on the program design and target participants. That said, there are fundamental marketing tactics that are relied on to reach potential program participants, such as:

- Marketing materials, such as brochures and leave behinds
- Community outreach meetings
- New or updated websites

Aggregators and solar contractors are currently recruiting customers for GSPA and Battery Bonus. Thus, a key undertaking for customer recruitment for BYOD will be clarifying the various program offerings for customers and supporting customer choice and best fit for each program.

xi. EM&V Planning

EM&V will be performed by the Company and a third-party consultant. The EM&V schedule and scoping will depend on the enrollment ramp rate of the program. Therefore, not all EM&V tasks will occur in the same year. As an example, if BYOD Level 3 has the highest participation, EM&V will focus on BYOD Level 3 rather than the other two levels. The BYOD Program's EM&V plan and schedule will be provided in the 2023 Modification and Evaluation ("M&E") report to be filed in November 2023, after the BYOD Program is implemented. More information about EM&V is included in Section VII [VII](#).

xii. Program Implementation Model

BYOD implementation has introduced a new program implementation model: Grid Service Provider¹¹ (aka dispatch agent). The Company introduced the term Grid Service Provider as a variation of an aggregator, where the Grid Service Provider would provide "non-firm" services. The DER Parties offered a Grid Service Provider that would be an intermediary to relay dispatch signals from the utility to the DERs and to "interface with the utility for the management, operation, and compensation of DERs"

¹¹ See Hawaiian Electric's Status Update filed in Docket No. 2019-0323 on December 4, 2020 at 24.

participating in BYOD.¹² The table below describes the roles and responsibilities of the different implementation models:

Program Functions	Company Administered (e.g. Fast DR, RDLIC)	Aggregator (e.g. GSPA)	Self-Aggregator (e.g. large, master meter customers)	Grid Service Provider (e.g. BYOD)
Contract Relationship for delivery of Grid Services	Participant Contracts with Company	<ul style="list-style-type: none"> • Aggregator Contracts with Company • Participant Contracts with Aggregator 	Participant Contracts with Aggregator	Participant Contracts with Company
Customer Recruitment	Company	Aggregator	Company	Company/Grid Service Provider
Installation & Provisioning	3 rd Party Service Provider	Aggregator	Self-Aggregator	Grid Service Provider
Monitoring & Control	Company (DERMS)	Aggregator & Company (DERMS)	Company (DERMS)	Company (DERMS) & Grid Service Provider (if DERs not directly connected)
Aggregation & Forecasting	Company (DERMS)	Aggregator	Self-Aggregator	Company (DERMS)
Maintenance	3 rd Party Service Provider	Aggregator	Self-Aggregator	Grid Service Provider

Definition of Program Functions:

- Customer Recruitment – Marketing, assessment of customer potential, execution of participant service agreement.
- Installation & Provisioning (aka Enablement) – Install and configure customer equipment, enroll customer and equipment in program, ensure equipment communicating with Monitoring & Control system.

¹² See Final Program Track and Emergency DR Program Proposal of Hawaii Solar Energy Association, Hawaii PV Coalition and Distributed Energy Resources Council (“DER Parties”) filed in Docket No. 2019-0323 on May 3, 2021 at 21.

- Monitoring & Control – Sending dispatch controls to equipment and receiving telemetry and status information. Architecture could be DERMS directly to customer equipment or to an Aggregator or Service Provider system.
- Aggregation & Forecast – Processes performed by DERMS or Aggregator system. Forecast is used to assess performance of delivered grid services.
- Maintenance – Ongoing management and monitoring customer equipment and/or connectivity to equipment (depending on program), responding to customer requests, routine customer check-ins and communication.

IV. Schedule

The FIP schedule is detailed in Appendix A and was created with the assumptions shown in Appendix B. The schedule will continue to evolve with real-time information, including updates based on Commission Orders. All updates will be provided in future M&E filings and A&S filings. For this FIP filing, Month 1 is defined as September 2022 because some of the FIP activities have started and are on-going.

To set the necessary program requirements and develop a more detailed FIP, an Order confirming the requirements for the Smart DER Tariff and the BYOD Program is required. The Company recommends allowing customers to enroll exclusively in the Smart DER Tariff as the base program for BYOD participation. If the Smart DER tariff is approved after BYOD, the Company will need to duplicate all CIT, DERMS, and SAP efforts for all interim DER programs. If only Smart DER customers can enroll in the BYOD Program, then existing customers can enroll in a GSPA program, which would simplify market segments and potentially decrease customer and market confusion between the two offerings.

V. Budgets and Investments

The software platform implementation costs to add IEEE2030.5 to DERMS will be covered within the Company's approved base rate budget (operation and maintenance). This includes the updates to CIT, SAP, and the additional software platform required to be added to the Company's DERMS. The Company has Commission approval to maintain and license the DERMS with cost recovery coming from the Renewable Energy Infrastructure Project ("REIP"). As such, the budget for this additional software platform implementation to add IEEE2030.5 to DERMS is not relying on REIP. However, the Company will consider seeking Commission approval for additional costs to operationalize and administer the BYOD program through either the DSM Surcharge or REIP, as applicable. As described earlier, many of these activities are interdependent, and linking BYOD to the Smart DER Tariff and may benefit BYOD implementation efforts relating to development work with CIT and SAP. The Company will have to prioritize accordingly to be able to implement these programs in a timely manner. The Company has started developing the CIT and SAP requirements this year based on the Company's current proposed schedule and assumptions.

VI. RISK

The risks associated with this FIP may impact the schedule and budget. These include, but are not limited to, the following:

Risk ID	Risk	Response strategy	Assumption
A	Delayed issuance of Commission Decision and Order jeopardizes July go-live date	May initially offer BYOD just to Smart DER Tariff customers and phase in other interim DER programs as applicable	Any incentive payment workflow requires a separate detailed test for each of the interim DER programs
B	Relying on customer internet poses a risk to maintain connectivity and deliver grid services	Company will monitor connectivity metrics and will update requirement as necessary	Customer internet is still the easiest and low-cost option available for early implementation
C	Go-live date of July will be difficult to achieve if Company has to build separate APIs for all dispatch agents or inverter manufacturers instead of relying on IEEE2030.5	Company proposes limiting API development to entities that can commit to delivering a significant enrollment (minimum 8MW for Oahu)	Some entities preferring to proceed with API and not international standard
D	If the market does not accept CSIP certification for inverter and aggregator as an acceptable certification route, implementation may be delayed	Company does not have a response strategy as the Company believes CSIP certification is the optimal process	Company believes building a new self-certification process is not an option to meet a July go-live date
E	If dispatch agent utilizes proprietary software platform to aggregate or translate, this increases program risks and the potential for stranded assets	Company will have to design a resource recovery plan	Company prefers IEEE2030.5 certification as primary solution but otherwise requests dispatch agent to provide alternative connection pathway to IEEE2030.5 that could be easily activated
F	There are no full-scale IEEE2030.5 programs that the Company can learn from	<p>Company will work with stakeholders to hold transparent discussions to ensure program development is successful</p> <p>Program will rely on EM&V process to modify program improvements</p>	<p>CSIP certification exists, but the programs (device and aggregator) are still in early phases</p> <p>California requires certification for 1MW and higher. This BYOD will be first full scale residential focused IEEE2030.5 program in the world.</p>

VII. Evaluation, Measurement, and Verification

The DER and DR Programs are proposed to be designed to provide low-cost solutions to all customers, increase renewables, and decrease GHG emissions. To continually improve these resources and ensure that benefits are being realized by the system, and therefore, by all customers, the proposed solution must be evaluated continuously through measurement and verification techniques as well as through more qualitative mechanisms. Ultimately, the EM&V process will be fundamental to helping the Company increase grid service participation and measure its performance.

The EM&V plan for all DER and DR Programs will focus on metrics like those shown in table below:

EMV	Tasks	Description
Customer Attrition	<ol style="list-style-type: none">1. Setup CIT database to report application metrics2. Analyze customer attrition.	The following attributes are expected to be available for report <ul style="list-style-type: none">• Number of customers• Number of MWs enrolled• Number of MWs by grid service• Number of PV installed
Impact Analysis	<ol style="list-style-type: none">1. Collect data of grid services events.2. Perform Impact analysis	Data may come from data logger, AMI, or directly from device.
Device availability	<ol style="list-style-type: none">1. Device availability measured via IEEE2030.5 or from dispatch agent reporting.2. Determine how to calculate percent of DERs connected to DERMS3. Report average monthly connection percentage	Company must verify dispatch agent can deliver telemetry to DERMS.
Utilization of grid services resources	<ol style="list-style-type: none">1. Run DERMS report on grid services events.2. Perform survey with System Operators regarding dispatch process and priorities.	Number of events will be tracked for BYOD similarly to GSPA method.
Benefit Cost Ratios	<ol style="list-style-type: none">1. Receive value of service from planning2. Calculate costs for each program3. Calculate B/C ratios	Company will use latest information available either from the IGP or the GNA calculation.

EM&V activities will continue each year and the scope will be decided by the November M&E filing to prepare for the following year. Even after the FIP reporting ends, the EM&V activities and reporting will continue in the M&E Reports. The EM&V activities and its reporting will have an important role in assessing the grid services impact from customer-sited storage and should lead to program modification to further make the programs cost-effective for all customers. As applicable, the Company will work with stakeholders to perform EM&V tasks and report on metrics.

VIII. Communication Plan

The communication plan includes delivery of metrics, RFP transparency, and stakeholder meetings. Table VII-1 provides the schedule for delivering reports and group meetings.

Table VIII-1: Summary and Schedule of Reports

Title	When	Description
FIP Status Updates	Filed twice a year in A&S Report Dkt 2007-0341 and in M&E Report Dkt 2007-0341	Updates to Appendix A and B of FIP will be filed in the A&S Report every March and M&E Report every November
Reporting Metrics	Filed annually in A&S Report Dkt 2007-0341	Metrics will be provided in A&S Report and posted on Company's website as applicable to its current metrics reporting requirements
Working Group Meetings	Every other week	Company has been meeting with the Parties since Q3 2022 on a bi-weekly basis and will continue to do so to discuss FIP and other relevant topics

The Company will continue to provide RFP transparency consistent with the Competitive Bidding Framework approved by the Commission. As such, the Company will not be sharing proposals received or bids proposed to protect the integrity of the RFP and to maintain the necessary competitive process for future procurements.

Under Docket No. 2007-0341, the Company has had two annual filings, one in March and one in November for over a decade to capture the status and plan for demand-side management activities. Future updates to the FIP are proposed to be included in these filings. The M&E Report, filed annually in November, is a report focused on presenting the M&E plan for the following calendar year. The Accomplishments & Surcharge ("A&S") Report, filed annually in March, is a report that summarizes the accomplishments of the previous year.

The reporting plan may change in the future as the Company concludes its key FIP activities. As FIP activities wind down, the Company will provide metrics and EM&V results through existing reporting channels such as the A&S Reports and on the Company's website where current grid services and DER metrics are posted.

Appendix A Schedule

Appendix A is the FIP schedule starting in September 2022 and ending November 2023. Tasks awaiting a Commission Decision and Order have a start date that may change. If the start date changes, all subsequent tasks will move out.

Appendix A - FIP Schedule

[illegible]

Appendix B Requirements, Deliverables, Tasks, and Assumptions

The table in Appendix B provides a list of all requirements identified for the FIP, the tasks to complete each requirement, and the assumptions used to create the tasks. The ID column that identifies the deliverables is associated with the rows in Appendix A. Each section is separated by a high-level requirement to execute the FIP for the various initiatives such as GSPA and BYOD implementation. The table is then followed by deliverables, tasks, and assumptions needed to accomplish the high-level requirement.

ID	Deliverables	Tasks	Assumptions
Requirement 1: Remote DER Dispatch Capabilities			
1.1	Establish IEEE 2030.5 Infrastructure	<ol style="list-style-type: none"> 1. Contract third-party 2030.5 server 2. Onboard third-party 2030.5 server. Onboarding the 2030.5 server is a key phase of the program that requires substantial piloting over the course of several months for key stakeholders to gain familiarity with the process to ensure the systems can be used and useful on day 1 of the program launch. 3. Integrate with DERMS. Integration with the DERMS requires several rounds of testing interfaces to ensure full functionality can be maintained. 	<p>Third-party 2030.5 server will be used</p> <p>DERMS native 2030.5 capability will be added once available by Hawaiian Electric's DERMS vendor</p>
Requirement 2: Customer Enrollment			
2.1	Specify customer enrollment procedure	<ol style="list-style-type: none"> 1. Document program requirements specifying customer enrollment process via CIT 	<p>Customer will apply for an amendment to an existing DER agreement to participate in BYOD and GSPA programs as it changes the normal operating characteristic of the DER system</p> <p>BYOD program requirement is known sufficiently in advance to design and configure updates to CIT system</p> <p>Customer enrollment can take two paths, either through a dispatch agent or directly with the Company if communications are directly to the inverter or gateway.</p>

ID	Deliverables	Tasks	Assumptions
2.2	Updates to CIT for new program enrollment	<ol style="list-style-type: none"> 1. Requirements & Design (Preliminary) 2. Finalize Requirements & Design 3. Plan, procure, mobilize 4. Build 5. Test (Sprint & UAT) 6. Change Management/Training 7. Go Live Prep/Deployment 	Test duration could be shortened if BYOD participants could only enroll via Smart DER program.
2.3	Updates to DERMS for program enrollment	<ol style="list-style-type: none"> 1. Design 2. Build 3. Test new program configuration in DERMS 	Test duration could be shortened if BYOD participants could only enroll via Smart DER program.
2.4	Validate and test end-to-end customer enrollment process	<ol style="list-style-type: none"> 1. Formal and informal software testing of various new configurations and workflows 	For each DER program (i.e. NEM, CGS, CSS, etc) that customer is able to participate for BYOD and GSPA, the development and testing will have to be repeated for each DER program workflow.
2.5	Updates to CIT for GSPA	<ol style="list-style-type: none"> 1. Streamline amendment process for grid service participation 	This will be part of the CIT update activities referenced in Section III.B.
Requirement 3: Customer Device Installation			
3.1	Direct to DER (requires CSIP certified inverter or gateway)	<ol style="list-style-type: none"> 1. Draft & publish document required for gateway or inverter parameters and process to demonstrate CSIP certification and steps to integrate to Hawaiian Electric's IEEE2030.5 platform (i.e. BYOD Implementation Handbook) 2. Integrate and test inverters and gateways 3. Update Hawaiian Electric's website with rules for gateway or inverter qualification 	<p>Applicable for customer that installs a CSIP certified gateway or inverter participating in BYOD Level 2 or Level 3</p> <p>Inverter or gateway will connect to customer wi-fi or ethernet.</p>
3.2	Dispatch Agent (requires CSIP certified aggregator)	<ol style="list-style-type: none"> 1. Draft & publish document required for dispatch agent parameters and process to demonstrate CSIP certification and steps to integrate to Hawaiian Electric's IEEE2030.5 platform (i.e. BYOD Implementation Handbook) 2. Integrate and test each dispatch agent 3. Update Hawaiian Electric's website list of eligible dispatch agents. 	<p>Applicable for customers participating in BYOD Level 2 or Level 3 through a dispatch agent.</p> <p>Dispatch agent is responsible to manage enrollment and ensure connectivity to participant devices and DERMS.</p>

ID	Deliverables	Tasks	Assumptions
3.3	GSPA Aggregator	<ol style="list-style-type: none"> 1. Update documentation for GSPA aggregator integration (fka Aggregator Handbook) 2. Integrate and test each new aggregator 	<p>Applicable for customers participating in new GSPA programs through an aggregator.</p> <p>Aggregator is responsible to manage enrollment and ensure connectivity to participant devices and DERMS in order to maintain contracted capacity.</p>
Requirement 4: Communication Technologies			
4.1	Specify appropriate WAN communication interface for DER to participate in programs	<ol style="list-style-type: none"> 1. Develop program requirements specifying required WAN communication interface and expected responsibilities 2. Continue research and discussion on telecommunication options 3. Publish WAN communication requirements 	<p>Customer's home internet is the minimum allowable interface but Company may update this requirements depending on connectivity metrics and available telecom technologies</p> <p>Dispatch Agent may select their own communication technologies. The entity must also maintain the connectivity as part of the maintenance</p>
4.2	Maintenance	<ol style="list-style-type: none"> 1. Draft & publish maintenance requirements with dispatch agent(s) 2. Draft & publish maintenance requirements with a 3rd party vendor 	<p>Dispatch agent is CSIP certified as an aggregator in California for participation in BYOD</p> <p>Dispatch agent has achieved integration with DERMS</p> <p>Third-party vendor may be required to maintain direct-to-invertor participants.</p>
Requirement 5: Advanced Inverter Functionalities			
5.1	Deploy advanced inverter functionalities	<ol style="list-style-type: none"> 1. Program requirements specifying overlap of CSIP qualification with Hawaiian Electric's Qualified Equipment List 	<p>CSIP-certified inverters/gateways/dispatch agents will be required for program participation</p> <p>Inverter functionalities necessary to facilitate DER telecommunication to participate in programs by using current Rule 14H requirements at the time of program launch, or other equivalent means for legacy devices such</p>

ID	Deliverables	Tasks	Assumptions
			as a gateway capable of protocol conversion to a capable inverter.
Requirement 6: Cybersecurity			
6.1	Conformance to NIST Special Publication 800-53	1. Review on case by case of participating resources against the NIST Special Publication 800-53 guideline. 2. Develop a conformance requirement document as applicable.	NIST Special publication 800-53 is meant as an interim guideline for cybersecurity. Future cybersecurity standards, including IEEE 1547.10, will be evaluated and considered for future updates.
Requirement 7: System Operations and Dispatch Manuals			
7.1	Update System Operations dispatch priorities	1. Updated System Operations dispatch priorities	System Operations to decide the most feasible dispatch priorities to maintain grid reliability ahead of economic performance BYOD program will not require EMS integration and therefore dispatch will be done directly via DERMS.
Requirement 8: EMS Integration			
8.1	N/A	N/A	N/A
Requirement 9: Billing and Crediting Systems			
9.1	Update billing and crediting systems for BYOD Level 1	1. Update billing and crediting system from battery bonus program to BYOD Level 1	BYOD incentive and rate structure known sufficiently in advance to design and configure Company's billing and crediting systems such that program can go live in July 2023. BYOD Level 1 will be similar to Battery Bonus.
9.2	Update billing and crediting systems for BYOD Level 2 & 3	1. Requirements & Design (Preliminary) 2. Finalize Requirements & Design 3. Plan, procure, mobilize 4. Build 5. Test (Sprint & UAT) 6. Change Management/Training 7. Go Live Prep/Deployment	BYOD incentive and rate structure known sufficiently in advance to design and configure Company's billing and crediting systems such that program can go live in July 2023. BYOD Level 2 expected to be different but similar in concept to Level 1, therefore potentially the development phase may be shortened. BYOD Level 3 may be similar to

ID	Deliverables	Tasks	Assumptions
			BYOD Level 2 and therefore development period could be shorter in duration.
9.3	Participant Performance Calculator	1. Develop and document performance criteria 2. Build performance calculator tool	Potential approach: BYOD1: use AMI data to track any large deviation from normal usage pattern during event hours. BYOD2&3: use inverter data via 2030.5 to verify kw delivered. Calculate event performance after each event.
Requirement 10: Customer Recruitment			
10.1	Update company outreach effort	1. Update/launch website with BYOD program rules and processes	Website update development will begin after Commission Order of the BYOD Programs and after program requirements is fully developed.
Requirement 11: EM&V			
11.1	GSPA	1. GSPA EM&V in progress (scoping, data collection, and analysis)	Water heater has been assessed, and therefore most likely the next phase of EM&V will be the residential battery performance.
11.2	Battery Bonus	1. Verify participation of batteries. 2. Verify participation at committed capacity. 3. Verify energy exported is 70% of committed capacity.	EM&V performed by the Company. Use AMI data to calculate export energy.
11.3	BYOD Level 1	1. Scope and timing of EM&V will be determined after program goes live.	EM&V activities will be prioritized by how much enrollment is achieved. Pending outcome of the program, the EM&V will target assessment for all five islands. However, if there are variance in customer sign-ups by islands, EM&V for particular year may focus on subset of islands.
11.4	BYOD Level 2	1. Scope and timing of EM&V will be determined after program goes live.	EM&V activities will be prioritized by how much enrollment is achieved. Pending outcome of the program, the EM&V will target assessment for all five islands. However, if there are

ID	Deliverables	Tasks	Assumptions
			variance in customer sign-ups by islands, EM&V for particular year may focus on subset of islands.
11.5	BYOD Level 3	1. Scope and timing of EM&V will be determined after program goes live.	<p>EM&V activities will be prioritized by how much enrollment is achieved.</p> <p>Pending outcome of the program, the EM&V will target assessment for all five islands. However, if there are variance in customer sign-ups by islands, EM&V for particular year may focus on subset of islands.</p>

CERTIFICATE OF SERVICE

I hereby certify that on this date, a copy of the foregoing document, together with this Certificate of Service, were duly served upon the following parties as set forth below:

Party	Email
Dean Nishina Executive Director Division of Consumer Advocacy Department of Commerce and Consumer Affairs 335 Merchant Street, Room 326 Honolulu, Hawaii 96813	dnishina@dcca.hawaii.gov consumeradvocate@dcca.hawaii.gov
Chris Debone President Distributed Energy Resource Council of Hawaii P.O. Box 2553 Honolulu, Hawaii 96813	chris@hawaiienergyconnection.com
Beren Argetsinger Tim Lindl Keyes & Fox LLP P.O. Box 166 Burdett, NY 14818 Attorneys for Hawaii PV Coalition	bargetsinger@keyesfox.com tlindl@keyesfox.com
Isaac H. Moriwake Kylie W. Wager Cruz Earthjustice 850 Richards Street, Suite 400 Honolulu, Hawaii 96813 Attorneys for Hawaii Solar Energy Association	imoriwake@earthjustice.org kwager@earthjustice.org

DATED: Honolulu, Hawai'i, September 30, 2022.

/s/ Blaine Watanabe
Blaine Watanabe
HAWAIIAN ELECTRIC COMPANY, INC.

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2022 Sep 30 PM 14:16

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